UNITED STATES ENVIRONMENTAL PROTECTION AGENCY
RESEARCH TRIANGLE PARK, NC 27711

MAR 01 2013

OFFICE OF
AIR QUALITY PLANNING
AND STANDARDS

MEMORANDUM

SUBJECT: Comments on the Science Advisory Board's (SAB) Draft Report on Animal Emissions Estimating Methodologies from the National Air Emissions Monitoring Study

FROM: Stephen D. Page, Director
Office of Air Quality Planning and Standards (C404-04)

TO: Angela Nugent, Designated Federal Officer
EPA Science Advisory Board Staff Office (1400R)

In February 2012, the Environmental Protections Agency's Office of Air Quality Planning and Standards sent background material and specific charge questions to the Science Advisory Board (SAB) requesting review and comment on the draft emissions estimating methodologies (EEMs) for certain animal feeding operations (AFOs).[1] The SAB convened the *Animal Feeding Operations Emission Review Panel* (Panel) to respond to this request. The Panel met over several months, held several public meetings and prepared a draft SAB report. On December 3, 2012, the SAB posted a draft cover letter and draft report for public information. It is my understanding that the SAB will consider this draft report in a meeting scheduled in March 2013.

We have reviewed the draft report, and have prepared comments that I believe will be useful to the SAB as they consider any changes to the draft report (see attached). I request that you forward these comments to the SAB for their consideration.

The EPA's current task is the development of EEMs for AFOs, using statistically-based methodologies to develop emissions factors for select types of AFOs from data collected through a National Air Emissions Monitoring Study (NAEMS). We are undertaking this effort in harmony with both a National Academy of Sciences (NAS) recommendation that the EPA develop an interim method for estimating emissions while we participate in a longer-term effort to develop process-based EEMs, and with objectives outlined in a consent agreement the EPA entered into with participating AFOs who funded the NAEMS. The EPA remains committed to fulfilling this short-term goal of developing EEMs for estimated emissions from AFOs, based on scientifically and statistically sound methods. The statistical-based EEMs must also be easily implemented by the agricultural community and other users, and be based on non-proprietary inputs. The charge questions we referred to the SAB, and the background information we provided to the SAB only pertained to EPA's efforts in developing statistically-based EEMs, since that is the focus of EPA's current effort.

[1] *See* memorandum from Stephen D. Page, Director, Office of Air Quality Planning and Standards, to Ed Hanlon, Designated Federal Officer, Animal Operations Emissions Review Panel (February 17, 2012).

Overall, the draft report provides insightful comments and recommendations to some of the EPA's charge questions related to the statistically-based, draft EEMs, and I appreciate the constructive input. In other areas, however, the report provides few comments on the statistical approach, while providing more extensive recommendations on shifting to a process-based methodology. In some cases, the responses to the charge questions are not well-substantiated or are incomplete, and therefore are difficult for the EPA to relate to the issues on which we are seeking the panel's advice to refine the statistical models.

The EPA acknowledges that a longer-term research effort is necessary to develop process-based approaches for estimating emissions and appreciates the SAB's recommendations on this longer term effort. That is not the task at hand, however, and the EPA hopes that in its final report, the panel will address all of the charge questions in such a way that we can refine the statistical approach.

Please submit these comments and observations on the draft report to the SAB for consideration at the March 2013 meeting. I am confident that the SAB's final response will improve the EPA's final version of the statistically-based EEMs. If you have any questions relating to this information, feel free to contact me or Bill Harnett of my staff on (919) 541-5616.

ATTACHMENT
Office of Air Quality Planning and Standards Staff Comments on Draft Report – SAB Review of EEMs for Broiler Animal Feeding Operations and for Lagoons and Basins at Swine and Dairy Animal Feeding Operations.

On February 17, 2012, the Environmental Protection Agency's Office of Air Quality Planning and Standards sent background material and specific charge questions to the Science Advisory Board (SAB) requesting review and comment on the draft emissions estimating methodologies (EEMs) for certain animal feeding operations (AFOs).[2] The SAB convened the *Animal Feeding Operations Emission Review Panel* (Panel) to respond to this request. The Panel met over several months and held several public meetings and prepared a draft SAB report. On December 3, 2012, the SAB posted a draft cover letter to Gina McCarthy and the draft report that would respond to our request. The SAB will consider this draft report in a meeting in March 2013, and then issue a final SAB report that responds to the charge questions shortly thereafter.

The EPA's current task is the development of EEMs for AFOs, using statistically-based methodologies to develop emissions factors for select types of AFOs from data collected through a National Air Emissions Monitoring Study (NAEMS). We are undertaking this effort in harmony with both a National Academy of Sciences (NAS) recommendation that the EPA develop an interim method for estimating emissions while we participate in a longer-term effort to develop process-based EEMs, and with objectives outlined in a consent agreement the EPA entered into with participating AFOs who funded the NAEMS. The EPA remains committed to fulfilling this short-term goal of developing EEMs for estimated emissions from AFOs, based on scientifically and statistically sound methods. The statistical-based EEMs must also be easily implemented by the agricultural community and other users, and be based on non-proprietary inputs. The charge questions we referred to the SAB, and the background information we provided to the SAB pertained only to the EPA's efforts in developing statistically-based EEMs, since that is the focus of the EPA's current effort.

Overall, the draft report provides insightful comments and recommendations to some of the EPA's charge questions related to the statistically-based, draft EEMs, and I appreciate the constructive input. In other areas, however, the report provides few comments on the statistical approach, while providing more extensive recommendations on shifting to a process-based methodology. In some cases, the responses to the charge questions are not well-substantiated or are incomplete, and therefore are difficult for the EPA to relate to the issues on which we are seeking the panel's advice.

The EPA acknowledges that a longer-term research effort is necessary to develop process-based approaches for estimating emissions and appreciates the SAB's recommendations on this longer term effort. That is not the task at hand, however, and the EPA hopes that in its final report, the panel will address all of the charge questions in such a way that we can refine the statistical models.

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[2] *See* Memo. from Stephen D. Page, Director Office of Air Quality Planning and Standards, to Ed Hanlon, Designated Federal Officer, Animal Operations Emissions Review Panel (February 17, 2012) – attached.

Background

In 2005, the EPA entered into a voluntary air compliance consent agreement (the Agreement) with certain members of the AFO industry (Participants) under which the industry funded a National Air Emissions Monitoring Study (NAEMS). As reflected in the Agreement, the NAEMS addresses the National Academy of Sciences' short-term recommendation to conduct a coordinated research program designed to allow EPA to produce a scientifically-sound basis for measuring and estimating air emissions from AFOs. The AFOs, and state and federal regulators will use these EEMs to determine whether an AFO emits air pollutants at levels that require the facility to apply for permits under the Clean Air Act (CAA), or to submit notifications under Comprehensive Environmental Response, Compensation and Liability Act (CERCLA) or Emergency Planning and Community Right-To-Know Act (EPCRA). The EPA remains obligated under the Agreement to develop EEMs from the NAEMS data and other available data as soon as practicable.

To assure that users can easily implement the EEMs, and that the EEMs can apply broadly, the EEMs we develop should be based on readily-available, non-proprietary data that allow agricultural producers and other users to follow straightforward procedures to estimate emissions. As discussed in the draft EEM documents, the EPA considered several factors while developing the draft EEMs, one of these being data availability. For the EEMs to be useful to all parties, the EPA decided not to use data that the AFO industry considered confidential (e.g., feed composition). We also considered the ease of implementing the EEMs during the development process. We concluded that by limiting the number of input parameters, all interested parties can easily implement the EEMs. The EPA believes that the limited number of input parameters improves the user-friendliness of the EEMs, while also providing a credible assessment of the emissions from an AFO.

The EPA acknowledges that a longer-term research effort is necessary to develop process-based models for estimating emissions. The NAS's long-term objective focused on development of a process-based model to estimate emissions from each major stage of the livestock production process (e.g. animal production and land application of manure). The EPA consistently has stated that its long-term strategy is to develop a process-based model for estimating emissions that considers the entire animal production process. As with any large and complex effort, however, development of a process-based model will take a number of years. In the meantime, as recommended by the NAS, the EPA maintains a goal of creating statistically-based EEMs. Thus, the EPA' current focus and the matter upon which we solicited SAB review, is development of statistical models.

Below, we highlight some observations related to different charge questions addressed in the draft report.

Question 1: **Please comment on the statistical approach used by the EPA for developing the draft EEMs for broiler confinement houses and swine and dairy lagoons/basins. In addition, please comment on using this approach for developing draft EEMs for egg-layers, swine and dairy confinement houses.**

Statistical vs. Process-based Model

As noted above, the EPA's current effort is to develop a statistically based model. Question 1 sought comments on that effort, including changes or alternative approaches that could improve the statistical models. Many of the comments in response to Question 1, however, focused on the preferability of process-based models, and in doing so, it distracts from issues central to improving the statistical approach.

While we believe that the report's comments on developing a process-based model are helpful and appropriate in focusing future work toward this longer-term objective, such recommendations might be better placed in an appendix and not within the central body of the document. Neither the EPA nor other commenters provided the Panel with information for developing process-based models during the Panel's deliberations, and the NAEMS study did not collect data from each major stage of livestock production to support development of process-based models. For purposes of assisting with our current effort, we ask SAB to consider more thoroughly focusing the final response on review and recommendations for refining the statistically-based EEMs, as we requested in the charge questions.

Representativeness of the Dataset

Monitoring and AFO experts agreed that the NAEMS study would result in representative data, because it represented industry-wide practices and locations. In contrast, the draft report concludes that the EPA should not use statistical or modeling tools for estimating emissions beyond the dataset because the EPA developed the draft EEMs from "limited data," and it may not be possible to extrapolate beyond the dataset to estimate emissions from other AFOs in the United States. While the draft report does not state a specific reason for this concern, it appears to be based on the number of AFOs studied compared to the number of AFOs in the United States.

AFO industry experts, university scientists, U.S. Department of Agriculture and the EPA scientists, environmental organizations, and other stakeholders worked collaboratively to develop the monitoring protocol used in the NAEMS. As reflected in the Agreement, the monitoring study's protocol specifies the number, type and geographical location of AFOs to be monitored. AFO industry experts and others designed the study to generate scientifically credible data to provide for the characterization of emissions from all major types of AFOs in all geographic areas where they are located. Technical experts on emissions monitoring at the EPA and from a number of universities concurred that the protocol would generate a valid sample that represents the vast majority of participating AFOs, and that increasing the number of AFOs monitored would be prohibitively expensive and not add substantially to the value of the data collected. 70 FR 4958, 4960. (January 31, 2005) The sites monitored for the NAEMS fulfilled all of the site selection criteria in the monitoring protocol and Agreement.

Because of the NAEMS project, the EPA has access to the most comprehensive and long-term study of air emissions from AFOs operations ever conducted. This study yielded an unprecedented volume of data from which to develop EEMs. The draft report, however, seems to conclude that because the industry is large, this dataset could not be representative without fully explaining the gaps in the dataset that create a definitive bias or demonstrate that the data is unrepresentative.

Although the draft report highlights a trend in the broiler confinement operations and dairy and swine lagoons data that warrants further analysis, this trend is not enough to establish that the data are not representative and that extrapolation beyond those limits "should be counter indicated." The draft report

notes that the data appear weighted toward periods of higher emissions and warmer weather and suggests that the EPA investigate this further. While this trend raises uncertainty, the draft report presents no evidence to conclude whether this trend resulted in any bias in the dataset that warrants a conclusion that the model should not be used beyond the dataset.

In light of the study's design, we ask the SAB to reconsider its conclusions with consideration to the level of uncertainty in the data, or identify evidence that supports a conclusion that the dataset is not representative of participating AFOs. For example, to what extent can the SAB identify any condition(s) that the dataset fails to represent relative to the percentage of industry that experiences this condition? How extreme is this condition to those included in the study design? Would this condition likely lead the model to under or overestimate emissions? Would inclusion of this condition encroach on proprietary information, or create undesirable complexity in the model? We do not believe that basing a conclusion that the statistical models "should not be used" beyond the dataset on a generalized discomfort with the number of test sites adequately supports the draft report's conclusions.

Limited Number of Input Parameters

The agricultural community and other users must be able to use the statistical model, and the EPA, therefore, must consider the user-friendliness of the model and data availability in determining the appropriate number, and which, parameters to include in the model. The EPA statistical analysis indicates that there is a strong correlation between the input parameters we selected and the emissions. The EPA believes that the limited number of input parameters improves the user-friendliness of the EEMs, while also providing a credible assessment of the emissions from an AFO using readily-available, non-confidential data.

The draft report, however, expresses a generalized discomfort with the statistical approach based on the small number of input parameters used in the EEMs models. The NAEMS study design considered the implementation and usability of EEMs by AFOs in the field in selecting parameters to monitor and include in the NAEMS study. As reflected in comments made by Michael Formica, National Pork Producers Council, at the March 2012 Panel meeting, "the EEMs cannot consider everything; it must allow a farmer, not a PhD university researcher, to estimate emissions." In addition, written comments submitted to SAB on behalf of the United Egg Producers, the National Pork Producers Council, and the United States Poultry and Egg Association indicate that the Agreement participants expressed a willingness to accept basic tools instead of "complicated, complex, and less-farmer-useful models" and prefer "look-up tables" for estimating air emissions. *See* written comments from Tom Hebert to Edward Hanlon on behalf of UEP, NPPC, and USPEA 8/20/2011.

We ask that the SAB reconsider these comments in reviewing and commenting on the statistical approach, and that the response focuses on the statistical approach as requested in the charge questions. The EPA's goal is to develop the most scientifically and statistically sound method possible for estimating AFO emissions, based on readily useable and available information. We welcome and appreciate the SAB's specific suggestions for adding to, or substituting for the parameters used in the draft statistical models, based on non-proprietary, available data.

Question 2: **Please comment on the agency's decision to combine the swine and dairy dataset to ensure that all seasonal meteorological conditions are represented. In addition, the agency also seeks the SAB's comments on whether the agency should combine lagoon and basin data.**

AFO experts and others appropriately designed the monitoring protocols for lagoons and basins to yield data to develop basic, statistical EEM models. The draft report recommends that the EPA should not combine swine and dairy datasets to fill in gaps in meteorological data, but should instead move to process-based models rather than the statistical models. The Agency understands the reported concerns and appreciates the comments on the complex biological differences between lagoons and basins. The The EPA will evaluate alternate solutions for assessing the seasonal meteorological differences in emissions within the statistical model.

While we recognize that lagoons and basins represent complex biological systems that are affected by numerous input variables, as explained above, the study design focused on evaluating parameters that can be used to develop basic models, based upon non-proprietary inputs. As previously noted, it is not our intent to develop process-based models, at this time, and the availability of data on proprietary information, such as feed, hinders our ability to consider some parameters in developing the statistical approach. If the SAB believes that non-proprietary, readily-available data currently exist on additional parameters that would improve the statistical model, then it would be helpful if the SAB identified these specific factors and explained how inclusion of the parameter will improve the statistical models to further support its response to the charge question.

Question 3: **Please comment on the agency's decision to use static predictor variables (SPVs) as surrogates for data on lagoon/basin conditions. Given the uncertainties in that approach, does the SAB recommend that the EPA consider specific alternative approaches for statistically analyzing the data that would allow for the site-specific lagoon liquid characteristics to be used as predictor variables?**

The swine and dairy open source studies represent the majority of operating conditions experienced in the industry, and data gaps do not undermine the general usefulness of developing statistically-based EEMs. Accordingly, the EPA is investigating alternatives for resolving data gaps in the dataset and developing a useful statistical model.

The draft report finds significant problems with the EPA's approach for using static predictor variables as surrogates for data on lagoon and basin conditions. Notwithstanding this concern, the draft report suggests development of a process-based model, rather than focusing on the specific solicitations in the charge questions. The draft report does not respond to the EPA's question as to whether the SAB recommends that the EPA consider specific alternative approaches for statistically analyzing the data that would allow for the site-specific lagoon liquid characteristics to be used as a predictor variable. Moreover, the draft report concludes that the NAEMS study is too narrow to provide reliable emissions estimates across the full range of conditions.

In contrast to the draft report, Michael Formica, National Pork Producers Council, indicated, in his oral comments at the March 2012 Panel meeting, stated that if you look at the regions represented in the study, and the production styles included, the study represented 95 percent of the pig operations in this country.

We believe that the data represent the predominant conditions experienced in the industry, and that any need to extrapolate beyond the dataset may create some uncertainties, but it will not undermine the general usefulness of the EEMs. Accordingly, we ask the SAB to focus its response on the specific charge question as it relates to the statistical model, with regards to the available, non-proprietary information and any related uncertainties.

Question 7: **Please comment on the approach EPA used to develop the draft broiler volatile organic compounds (VOC) EEM.**

The EPA developed the broiler house VOC EEM using NAEMS data collected from one broiler house over approximately one year. Although the EPA used data from only one broiler house, we believe that the data adequately represent broiler house emissions because broiler house operations tend to be fairly uniform. The sufficiency of the data is an important determination, because the Agreement provided that if the SAB determines that the available data are not adequate to support development of the EEM(s), then the EPA can delay development of the EEM(s) until adequate data are available.

The draft report concludes that there are significant limitations associated with the broiler VOC data collected as part of the NAEMS, and recommends that the EPA not use the data to develop a broiler VOC EEM at this time. The draft report provides a limited explanation to support this conclusion, and does not cite to any factual or scientific information on which the panel bases its conclusion that the data are unrepresentative. In fact, statements made by Panel members during their deliberation suggest an opposite conclusion with regards to the broiler VOC data. For example, during a public meeting of the Panel, Dr. Wheeler commented that broiler operations tend to be fairly uniform, and that the samples collected at the Kentucky broiler site are likely representative. Dr. Rotz made similar comments, indicating that the monitoring procedures used to measure VOC emissions seemed good and that the numbers are representative.

To the extent that Panelists raised uncertainties in discussions, those concerns related to the ability to properly speciate VOC emissions data. Since regulatory applicability is based on total VOC emissions and not emissions of any specific species, we do not believe this concern is relevant for the purposes of developing the EEM. In addition, the draft report raises concerns related to using canisters, and the retention of VOC within the carbon media used for collecting emissions samples. If under-collection of VOC or carbon retention occurred, it would bias the data in favor of a lower EEM, and we can recognize this uncertainty as we proceed with finalizing the EEM.

As Dr. Allen explained to the Panel at one of the public meetings, the EPA grades AP42 emissions factors as A, B, C and D based on the quality of the data used to generate the emissions factors. Dr. Allen urged the Panel not to let perfect be the enemy of the good. We share that sentiment. The broiler industry collected a lot of good data over an unprecedentedly long duration of time, and we can account for the level of uncertainty in grading the EEMs.

Given the agreement of experts that the farms studied would generate representative data, and that the NAEMS used scientifically sound methods to collect emissions data, and that broiler operations are fairly uniform, we ask that the SAB focus on characterizing the uncertainties in the statistical model based on the available data, rather than simply conclude that there are insufficient data to develop an EEM at all. If the final report maintains the conclusion that there are not enough data, then we ask that the final report substantiate this conclusion with a full explanation of the limitations upon which this conclusion is based, and the necessary research to eliminate these limitations. Moreover, we ask that the SAB provide the basis for its conclusion that the data are unrepresentative with scientific evidence rather than generalized concerns so that we may understand it better.

Conclusion

In sum, we understand the concerns with using the EEMs to regulate an entire industry, but we wish to emphasize that we are undertaking the first phase of a longer term process to develop a credible approach for assessing emissions from AFOs. We continue to solicit comments and input from the industry and will incorporate new information, as appropriate, for the purposes of improving our emissions estimation methods. The EPA remains committed to accurately accounting for uncertainties and moving forward, in the short-term with developing statistically-based EEMs based on scientifically and statistically credible methods.

While the Agreement requires Participants to use the EEMs if a Participant wishes to maintain the immunity aspects of the Agreement, any Participant may submit information during the public comment period to improve the final EEMs. Again, the EPA intends to work with other stakeholders, such as the Department of Agriculture, to continue with longer-term efforts to improve emission estimation methods for AFOs based on information that considers the entire production process.

We hope that the SAB will consider these observations on the draft report in preparing a final response to the charge. We are confident that the SAB's response will improve the EPA's final version of the EEMs.